MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

ECP3086 – MULTIMEDIA TECHNOLOGY AND APPLICATIONS

(RE)

12 OCTOBER 2019
2:30 p.m. – 4:30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of 5 pages including cover page with 4 Questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) Define **Multimedia System**. It should possess certain features in order to support the processing of continuous media. State any **three (3)** of these features.

[3 + 3 marks]

(b) Write HTML code to create a webpage as shown in Figure Q1(b). The filename of the image is "fet-mmu.png".

MMU MULTIMEDIA UNIVERSITY | FACULTY OF ENGINEERING & TECHNOLOGY

Bachelor of Engineering (Hons.) Electronics majoring in Robotics & Automation

Entry Requirements
• Pass Foundation/Matriculation in the related field from a recognised institution; OR • Pass STPM / A Level or its equivalent with 3 principals inclusive of Mathematics and Physics; OR • Pass UEC with minimum of grade B in at least five (5) subjects inclusive of Mathematics and Physics; OR • Pass Diploma in the related field from a recognised institution.
English Entry Requirement for International Students
A minimum score of 5.0 for IELTS or its equivalent
Career Prospects
Robotics Engineer, Industrial Automation, Control Engineer, Automotive Engineer, Manufacturing Engineer, Production Engineer, Mechatronics Engineer, Engineering Academician or Researcher.

Figure Q1(b)

[12 marks]

(c) Given the following string as input:
DESMSMDE
with the initial dictionary as shown in Figure Q1(c), encode the string with the LZW algorithm, showing the intermediate steps.

Index	Entry
1	E
2	M
3	S
4	D

Figure Q1(c)

[7 marks]

Continued...

Question 2

(a) Figure Q2(a) is a JPEG 8 × 8 quantization matrix. Explain why the values in the upper-left corner are smaller than the values in the bottom-right corner.

16	11	10	16	24	40	51	61
12	12	14	19	26	58	60	55
14	13	16	24	40	57	69	56
14	17	22	29	51	87	80	62
18	22	37	56	68	109	103	77
24	35	55	64	81	104	113	92
49	64	78	87	103	121	120	101
72	92	95	98	112	100	103	99

Figure Q2(a)

[3 marks]

(b) (i) What is the main advantage and disadvantage of an indexed image, as compared to a true colour (i.e. 24-bit) image?

[2 + 2 marks]

(ii) What is the number of bits used per pixel for the indexed image if only 128 colours are to be displayed?

[2 marks]

(iii) What is defined in the colour-map in the indexed image?

[2 marks]

(c) Calculate the storage size required to store an image with 480 × 240 pixels, and each pixel is able to display 256 different colours.

[6 marks]

(d) In JPEG coding, Differential Pulse Code Modulation (DPCM) is used on the DC component. Given that the DC coefficient of the first **seven** (7) image blocks are 23, 22, 19, 20, 24, 26 and 28. Construct DPCM-coded DC coefficient represented by a pair of symbol (size, amplitude), where size represents the number of bits needed for the coefficient while amplitude contains the actual bits.

[8 marks]

Continued...

Question 3

(a) Frequency masking and temporal masking are two psychological phenomena that are exploited in MPEG audio compression. Briefly explain their meanings.

[3 + 3 marks]

(b) Audio signals are often sampled at different rates. CD quality audio is sampled at 44.1 kHz rate while telephone quality audio sampled at 8 kHz.

(i) What are the maximum frequencies in the input signal that can be fully recovered for these two sampling rates?

[2 + 2 marks]

(ii) Briefly describe the theory that being use to obtain the results in (i).

[2 marks]

(iii) Predict the effect if an arbitrary input signal is directly sampled.

[2 marks]

(iv) Suggest a mechanism to solve problem introduced in (iii).

[2 marks]

(c) Differential Pulse code modulation (DPCM) is one of the method to convert analog audio signals into digital audio signals. Suppose a DPCM system uses a predictor and quantizer as given below:

$$\hat{f}_n = \text{fix}\left(\tfrac{1}{2}\left(\tilde{f}_{n-1} + \tilde{f}_{n-2}\right)\right)$$

$$\tilde{e}_n = Q[e_n] = 16 \times \text{fix}\left(\tfrac{1}{16}\left(255 + e_n\right)\right) - 256 + 8$$

where fix(x) returns the integral part of x. Figure Q3(c) shows the block diagram of the DPCM encoder.

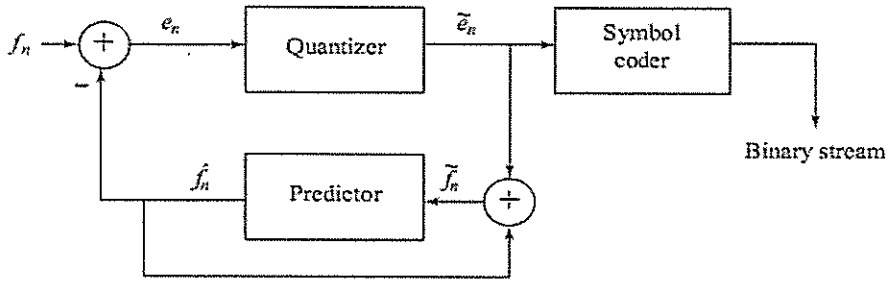

Figure Q3(c)

If the input signal, f_n has the following values, determine the output from the encoder $\left(\hat{f}_n, e_n, \tilde{e}_n, \tilde{f}_n\right)$:

f_1	f_2	f_3	f_4
90	120	160	140

[9 marks]

Continued...

Question 4

(a) The main thrust of High Definition TV (HDTV) is not to increase the "definition" in each unit area, but rather to increase the visual field especially in its width. State the **two** (2) salient differences between conventional TV and HDTV.

[4 marks]

(b) What is the key difference among I-frames, P-frames and B-frames in MPEG-2 video compression? Give the **two** (2) advantages of using B-frames.

[6 + 4 marks]

(c) A typical videoconferencing system consists of three important components, namely videoconferencing terminals, network, and multipoint control unit/multicast router. Define multipoint control unit/multicast router.

[5 marks]

(d) Media available in content-based retrieval system are indexed by their own visual content, such as colour, texture, shape, motion and etc. Sensory gap and semantic gap are the two main obstacles to implement the content-based retrieval system. Define sensory gap and semantic gap.

[6 marks]

End of Paper